§98.88 Definitions.

All terms used in this subpart have the same meaning given in the Clean Air Act and subpart A of this part.

Subpart I—Electronics Manufacturing

§98.90 Definition of the source category.

(a) The electronics manufacturing source category consists of any of the production processes listed in paragraphs (a)(1) through (a)(5) of this section that use fluorinated GHGs or N_2O. Facilities that may use these processes include, but are not limited to, facilities that manufacture micro-electromechanical systems (MEMS), liquid crystal displays (LCDs), photovoltaic cells (PV), and semiconductors (including light-emitting diodes (LEDs)).

(1) Any electronics production process in which the etching process uses plasma-generated fluorine atoms and other reactive fluorine-containing fragments, that chemically react with exposed thin-films (e.g., dielectric, metals) or substrate (e.g., silicon) to selectively remove portions of material.

(2) Any electronics production process in which chambers used for depositing thin films are cleaned periodically using plasma-generated fluorine atoms and other reactive fluorine-containing fragments.

(3) Any electronics production process in which wafers are cleaned using plasma generated fluorine atoms or other reactive fluorine-containing fragments to remove residual material from wafer surfaces, including the wafer edge.

(4) Any electronics production process in which the chemical vapor deposition (CVD) process or other manufacturing processes use N_2O.

(5) Any electronics manufacturing production process in which fluorinated GHGs are used as heat transfer fluids to cool process equipment, to control temperature during device testing, to clean substrate surfaces and other parts, and for soldering (e.g., vapor phase reflow).

§98.91 Reporting threshold.

(a) You must report GHG emissions under this subpart if electronics manufacturing production processes, as defined in §98.90, are performed at your facility and your facility meets the requirements of either §98.2(a)(1) or (a)(2). To calculate total annual GHG emissions for comparison to the 25,000 metric ton CO_2e per year emission threshold in §98.2(a)(2), follow the requirements of §98.2(b), with one exception. Rather than using the calculation methodologies in §98.93 to calculate emissions from electronics manufacturing production processes, calculate emissions of each fluorinated GHG from electronics manufacturing production processes by using paragraphs (a)(1), (a)(2), or (a)(3) of this section, as appropriate, and then sum the emissions of each fluorinated GHG by using paragraph (a)(4) of this section.

(1) If you manufacture semiconductors or MEMS you must calculate annual production process emissions of each input gas i for threshold applicability purposes using the default emission factors shown in Table I–1 to this subpart and Equation I–1 of this subpart.

$$E_i = S * EF_i * GWP_i * 0.001 \quad \text{(Eq. I-1)}$$

Where:

E_i = Annual production process emissions of input gas i for threshold applicability purposes (metric tons CO_2e).
S = 100 percent of annual manufacturing capacity of a facility as calculated using Equation I–5 of this subpart (m^2).
EF_i = Emission factor for input gas i (kg/m^2).
GWP_i = Gas-appropriate GWP as provided in Table A–1 to subpart A of this part.
0.001 = Conversion factor from kg to metric tons.
i = Input gas.

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(2) If you manufacture LCDs, you must calculate annual production process emissions of each input gas i for threshold applicability purposes using the default emission factors shown in Table I–1 to this subpart and Equation I–2 of this subpart.

$$\mathrm{E_i} = S * \mathrm{EF_i} * GWP_i * 0.000001 \quad \text{(Eq. I-2)}$$

Where:

E_i = Annual production process emissions of input gas i for threshold applicability purposes (metric tons CO_2e).

S = 100 percent of annual manufacturing capacity of a facility as calculated using Equation I–5 of this subpart (m^2).

EF_i = Emission factor for input gas i (g/m^2).

GWP_i = Gas-appropriate GWP as provided in Table A–1 to subpart A of this part.

0.000001 = Conversion factor from g to metric tons.

i = Input gas.

(3) If you manufacture PVs, you must calculate annual production process emissions of each input gas i for threshold applicability purposes using gas-appropriate GWP values shown in Table A–1 to subpart A of this part and Equation I–3 of this subpart.

$$\mathrm{E_i} = C_i * GWP_i * 0.001 \quad \text{(Eq. I-3)}$$

Where:

E_i = Annual production process emissions of input gas i for threshold applicability purposes (metric tons CO_2e).

C_i = Annual fluorinated GHG (input gas i) purchases or consumption (kg). Only gases used in PV manufacturing that have listed GWP values in Table A–1 to subpart A of this part must be considered for threshold applicability purposes.

GWP_i = Gas-appropriate GWP as provided in Table A–1 to subpart A of this part.

0.001 = Conversion factor from kg to metric tons.

i = Input gas.

(4) You must calculate total annual production process emissions for threshold applicability purposes using Equation I–4 of this subpart.

$$\mathrm{E_T} = \delta * \sum_i E_i \quad \text{(Eq. I-4)}$$

Where:

E_T = Annual production process emissions of all fluorinated GHGs for threshold applicability purposes (metric tons CO_2e).

δ = Factor accounting for heat transfer fluid emissions, estimated as 10 percent of total annual production process emissions at a semiconductor facility. Set equal to 1.1 when Equation I–4 of this subpart is used to calculate total annual production process emissions from semiconductor manufacturing. Set equal to 1 when Equation I–4 of this subpart is used to calculate total annual production process emissions from MEMS, LCD, or PV manufacturing.

E_i = Annual production process emissions of input gas i for threshold applicability purposes (metric tons CO_2e), as calculated in Equations I–1, I–2 or I–3 of this subpart.

i = Input gas.

(b) You must calculate annual manufacturing capacity of a facility using Equation I–5 of this subpart.

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$$S = \sum_{x}^{12} W_x \quad (\text{Eq. I-5})$$

Where:

S = 100 percent of annual manufacturing capacity of a facility (m^2).
W_X = Maximum designed substrate starts of a facility in month x (m^2 per month).
x = Month.

§ 98.92 GHGs to report.

(a) You must report emissions of fluorinated GHGs (as defined in § 98.6) and N_2O. The fluorinated GHGs that are emitted from electronics manufacturing production processes include, but are not limited to, those listed in Table I–2 to this subpart. You must individually report, as appropriate:

(1) Fluorinated GHGs emitted from plasma etching.

(2) Fluorinated GHGs emitted from chamber cleaning.

(3) Fluorinated GHGs emitted from wafer cleaning.

(4) N_2O emitted from chemical vapor deposition and other electronics manufacturing processes.

(5) Fluorinated GHGs emitted from heat transfer fluid use.

(6) All fluorinated GHGs and N_2O consumed, including gases used in manufacturing processes other than those listed in paragraphs (a)(1) through (a)(5) of this section.

(b) CO_2, CH_4, and N_2O combustion emissions from each stationary combustion unit. You must calculate and report these emissions under subpart C of this part (General Stationary Fuel Combustion Sources) by following the requirements of subpart C of this part.

§ 98.93 Calculating GHG emissions.

(a) You must calculate total annual facility-level emissions of each fluorinated GHG used in electronics manufacturing production processes at your facility, for each process type, using Equations I–6 and I–7 of this subpart according to the procedures in paragraphs (a)(1), (a)(2), (a)(3), (a)(4), (a)(5), or (a)(6) of this section, as appropriate. Facilities to which the procedures in paragraphs (a)(1) of this section or (a)(2) of this section apply may elect to use the procedures in paragraph (a)(3) as an alternative. If your facility uses less than 50 kg of a fluorinated GHG in one reporting year, you may calculate emissions as equal to your facility's annual consumption for that specific gas as calculated in Equation I–11 of this subpart. Where your facility is required to perform calculations using default emission factors for gas utilization and by-product formation rates according to the procedures in paragraphs (a)(1) or (a)(2) of this section, and default values are not available for a particular input gas and process type or sub-type combination in Tables I–3, I–4, I–5, I–6, or I–7, you must follow the procedures in paragraph (a)(6) of this section.

$$\text{Pr}ocesstypeE_i = \sum_{j=1}^{N} E_{ij} \quad (\text{Eq. I-6})$$

Where:

ProcesstypeE$_i$ = Annual emissions of input gas i from the processes type (metric tons).
E_{ij} = Annual emissions of input gas i from recipe, process sub-type, or process type j as calculated in Equation I–8 of this subpart (metric tons).

N = The total number of recipes or process sub-types j that depends on the electronics manufacturing facility and emission calculation methodology. If E_{ij} is calculated for a process type j in Equation I–8 of this subpart, N = 1.
i = Input gas.
j = Recipe, process sub-type, or process type.